

CLAIMS

1. A particle beam accelerator comprising:

a vacuum chamber;

5 a magnet which generates a constant magnetic field in the vacuum chamber;

acceleration electrodes which generates a magnetic field in a direction perpendicular to the direction of the magnetic field generated by the magnet in the vacuum chamber;

10 an extraction electrode which extracts charged particles accelerated in the vacuum chamber; and

a target cell provided at a position at which the charged particles extracted by the extraction electrode strike;

15 wherein at least a part of surfaces exposed to the charged particles of the vacuum chamber, the acceleration electrodes, the extraction electrode and/or the target cell is made of a material including an element having atomic number larger than copper.

20 2. The particle beam accelerator according to claim 1, wherein the particle beam accelerator is a cyclotron, and the at least a part of the surfaces exposed to the charged particles comprises surfaces, arranged along the circular orbit, of the charged particles of structural components
25 including said vacuum chamber, said acceleration

electrodes, said extraction electrode and said target cell.

3. The particle beam accelerator according to claim 1 or 2, wherein the at least a part of the surfaces exposed to the charged particles of the vacuum chamber, the
5 acceleration electrodes, the extraction electrode and/or the target cell is covered by a sheet of the material.

4. The particle beam accelerator according to claim 3, wherein the sheet of the material is thick enough to stop the accelerated deuteron therein.

10 5. The particle beam accelerator according to claim 1 or 2, wherein the at least a part of the surfaces exposed to the charged particles comprises a plating layer including the material.

6. The particle beam accelerator according to claim 1 or
15 2, wherein the at least a part of the surfaces exposed to the charged particles comprises a coating film including the material.

7. The particle beam accelerator according to one of claims 1 to 6, wherein the at least a part of the surfaces
20 exposed to the charged particles is the acceleration electrodes and the element is gold.

8. The particle beam accelerator according to one of claims 1 to 7, wherein the at least a part of the surfaces exposed to the charged particles includes a target window
25 of the target cell.

9. The particle beam accelerator according to one of claims 1 to 7, wherein the at least a part of the surfaces exposed to the charged particles comprises a target window of said target cell and an inner side thereof except the target window.

10. The particle beam accelerator according to one of claims 1 to 9, wherein the at least a part of surfaces includes an area adjacent to a target window of the target cell.

11. The particle beam accelerator according to one of claims 1 to 10, further comprising a structural element made of the material arranged at a position in an area not including the electrodes for the resonator or in the valley of the poles of the electromagnet to block a part of the beam.

12. The particle beam accelerator according to one of claims 1 to 11, further comprising a heater provided at one of the components arranged in said vacuum chamber for heating the one of the components.

13. The particle beam accelerator according to one of claims 1 to 12, further comprising an instrument, provided in said vacuum chamber, for measuring a current of the accelerated beam, wherein the at least a part of the surfaces exposed to the charged particles comprises a surface of the instrument facing the beam.

14. The particle beam accelerator according to one of

claims 1 to 13, wherein dose equivalent of neutrons for a deuteron beam of energy of 3.5 MeV of the material is equal to or smaller than $2.5 * 10^{-1}$ Sv/h/ μ A/sr.

15. The particle beam accelerator according to claim 14,
5 wherein the dose equivalent of neutrons for a deuteron beam of energy of 3.5 MeV of the material is equal to or smaller than $2.5 * 10^{-2}$ Sv/h/ μ A/sr.

16. The particle beam accelerator according to one of
10 claims 1 to 15, wherein the target cell is separated from the other components in the particle beam accelerator, and a shielding wall for shielding radioactive rays generated in the target cell is provided around the target cell.

17. The particle beam accelerator according to one of
15 claims 1 to 16, further comprising a synthesis apparatus which receives a substance generated in the target cell as a starting material, the synthesis apparatus being integrated as a unit with the target cell.